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Feature Article

Databases Move to Next Level In Distributed Mission Training

by Joshua A. Kutner

Air Force officials agree that they would like pilots to be able to fly more hours than are currently affordable. Recent advances in simulation technology, however, help to provide a more realistic training environment than what was possible in previous simulators. A case in point is the Distributed Mission Training (DMT) program, which is gaining popularity within the service.

"Pilots are getting very few flight hours, but this augments their training," said Marv Wellik, a consultant at the Air Force Research Laboratory (AFRL), in Mesa, Ariz. Wellik told National Defense that he wanted to make it especially clear that with DMT, the Air Force is not trying to take flight hours away from the pilots, but instead "add to their training."

DMT is taking shape at AFRL. "The concept was born at the lab," said Wellik. It is a method that incorporates advanced 3-D images and intelligence data into a training environment that allows pilots at multiple locations to practice missions together. These missions can range from individual and team exercises to full theater-level battles.

The Air Force recently conducted its first DMT exercise with an international partner when it flew with U.K. Tornadoes, said Wellik. Other allies have been expressing their interest in the concept, he added.

In maturing DMT, there has been a "big push" for the Air Force to collaborate with industry on research and development, said Wellik.

Collaboration

The need to acquire commercial solutions is understood and being accepted, Wellik commented. Air Force leaders already have signed agreements with Lockheed Martin Corporation and The Boeing Company so that the F-15 and F-16 fighters can take part in DMT. Boeing received a 15-year, $574 million contract to implement DMT on F-15C fighters. Lockheed Martin received $249 million for DMT on the F-16, and PLEXSYS Interface Products Inc. won a $75.6 million contract for the airborne warning and control system allotment. In 1998, AFRL proved that the two flight simulators—F-15C and F-16—could operate interactively from multiple locations. Boeing, in June 2000, demonstrated the ability to link its Joint Strike Fighter full-mission simulator to F-15s located at another site.

One of the most recent DMT contract awards was given to TRW Inc., by Wright-Patterson Air Force Base. Under this five-year contract, worth $284.7 million, TRW will establish, operate and maintain a networked, real-time DMT system. The company will start by linking trainers at Langley Air Force Base, Va.; Eglin Air Force Base, Fla.; and Tinker Air Force, Okla. Eventually, more than 50 training sites will be linked worldwide, company officials said.

TRW's partners include Litton-TASC Inc., SPARTA, CAE Electronics Ltd. and MATCOM for this project.

Another one of the latest Air Force-industry partnerships is designed to bring enhanced realism to DMT. AFRL signed a CRADA, or cooperative research and development agreement, with SGI Federal, a subsidiary of SGI Inc. (Silicon Graphics), in which the company will deliver sophisticated graphics systems during the next five years. The CRADA requires SGI Federal to "work with AFRL and industry partners to evaluate the enhancement and possible productization of visual display systems and their commercial application for future training programs," according to Greg Slabodkin, spokesman for SGI Federal's government and research division. What that means is that SGI Federal will work to instill as much realism into DMT simulation visuals by creating databases that deliver real-time information, such as geospatial imaging and intelligence.

In this so-called Information Age, the defense and intelligence communities have merged, said John Burwell, SGI Federal marketing director of intelligence and defense. "That's primarily because of data," he said in an interview. "The intelligence community has an incredible source of image data that comes down from a variety of national, technical means. And that data is used for a variety of different intelligence purposes and policy making. The data is up-to-date. It's very high-resolution, and it represents the real world. It is very accurate.

"If you look at the simulation community, traditionally what [manufacturers] have done is they've built these generic databases that look sort of like the area—they are either geotypical, meaning they have vegetation and terrain that are sort of typical of an area, or they're just generic," Burwell asserted. "For years, this mission rehearsal community has really wanted to rehearse

their missions, and they want to fly around in real world locations, so they can recognize the targets that they're going to go after. And they have not been able to do that in simulators, because it's just been too hard and expensive to build databases like that, and the data hasn't been available."

SGI Federal is a hardware provider for much of the intelligence community, according to Burwell. The company's Origin and Onyx desktop systems are among the most widely sold.

"When we went down to the Air Force Research Lab [before the inception of DMT], we demonstrated the fact that you could do a very large-area, geospecific, photospecific visual database of an area," said Burwell. "They took that, and it led to a lot of the requirements that they drove into this Distributed Mission Training program for F-16 and really led to us being selected by Lockheed Martin and Boeing.

"Now that we are moving out in that direction, we're trying to develop a whole process where that data can come down and be fused with the three-dimensional data. And so ... we've developed a CRADA to do this. So the CRADA will be a vehicle by which we can start to jointly develop these technologies to be able to take this space-based and even air-breathing, geospecific, image data, and be able to get that very rapidly into a database."

An emerging trend that contributes to this ever-expanding collection of data is the use of video. "There is a huge, huge amount of video out there now," said Burwell. "There is hardly anything that anybody does anymore that is not videotaped. You go into any store. You walk around outside. You've got UAVs [unmanned aerial vehicles] flying around the battlespace—Global Hawk and Predator. The thing is that all this video is being taken, but it's very, very hard to do anything with it because there's just so much of it. You have this pixel-to-person ratio—you need tools to use this data.

"What we've been doing is working with some of our software partners to develop that, which is this video analysis and exploitation system VAES."

VAES is SGI's commercial off-the-shelf real-time visual data system. It runs on the Silicon Graphics Onyx2 visualization supercomputer. The system takes visual data collected by UAVs, hand-held cameras, surveillance aircraft and seagoing vessels and converts it to meet the needs of the intelligence community.

SGI is trying to incorporate VAES into its CRADA with AFRL.

Other Trends

There are other trends that are driving the simulation market, said Burwell. "The trends that we see in the [simulation] industry right now, I think, are two," he said. "There is a split going on in that there is a certain class of customers, like the Air Force with DMT, where no matter how much compute and graphics performance you can give them, they always want more

and graphics performance you can give them, they always want more.

"So they want to continue to get higher fidelity, more performance, because that's critical for their training requirements. What the Air Force is trying to do with DMT is they're trying to trade operational flight hours with time in a simulator. That's something that's been done in the civil airline market, but never in the military, because the problems that they are trying to solve are so much tougher with battlefield environments and global databases.

"So the Air Force has a really unique problem. So what they're doing is trying to solve that through programs like DMT, so they can train like they fight and be able to produce systems that replicate the real world in every aspect—in terms of visual databases that they're flying in, in terms of fidelity of the controls in the simulator, in terms of the fidelity of the flight dynamics or how it flies. It has to be realistic. And so this is one type of customers that just wants more and more," said Burwell.

Wellik, however, maintains that the Air Force is not trying to trade flight hours with time in the simulator, but rather offer time in the simulator on top of operational flight hours.

The other trend, Burwell said, involves those customers that are satisfied with the quality of the their simulation and training systems, but want them cheaper.

"They just want it cheaper, and they want it dirt cheap," said Burwell.

AFRL takes part in both trends, said Wellik. "Of course, we want it cheaper, and it is also getting better," he said. Wellik praised SGI's systems, calling them the "cutting edge of technology."

SGI's Burwell said his company has been aggressive in seeking government business.

"We've been very aggressive in our product developments," said Burwell. " ... [What is] interesting is that you talk about general trends in industry, [and they're] not unique to the simulation space. We see that in a lot of other markets as well. As a result of that, our product line really reflects that in a sense that we have whole high-end [catalog] of both servers and graphics systems."

SGI, headquartered in Mountain View, Calif., has built its reputation on providing desktop systems with powerful compute and graphics capabilities to government customers, said Burwell. "I think it is safe to say, we have always been focused on this market, and our focus continues as the company evolves and as our products evolve," he said.

Now an Integrator

"We have continually developed products that address this market space in

particular, especially with some of the new products we have [put] out in the last five to seven years."

The company today considers itself more of a systems provider and integrator, rather than just a provider, said Burwell. "All the aerospace and defense companies that have traditionally been our customers for these products are rising to a higher level of integration, whereas they used to be willing to just buy machines from us and to develop all their own software and do all their own integration of visual systems solutions based on our hardware. They don't do that anymore. They want us to take that responsibility."

Burwell pointed out that SGI Federal offered a full turn-key solution for Lockheed Martin's F-15I. "We were actually responsible for the visual system, which means the display system, all the hardware and all the software system integration and program management that goes along with that," he said.

SGI also recently took over Intergraph's hardware manufacturing business. "And now with us taking over the hardware business from Intergraph, we will be offering their [patented] product line badged as an SGI product. So our low-end entry-level systems really fit the customers that are interested in products that are going down the cost curve. As we keep developing more technology, higher-end systems are supporting the guys who are driving the curve," he said.